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| 10/056,209      | 01/28/2002  | Yasuyuki Kusumoto    | MAM-010             | 6909             |

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| EXAMINER |
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MERCADO, JULIAN A

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| ART UNIT | PAPER NUMBER |
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1745

DATE MAILED: 05/28/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

# Office Action Summary

Application No.

10/056,209

Applicant(s)

KUSUMOTO ET AL.

Examiner

Julian Mercado

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☐ Responsive to communication(s) filed on \_\_\_\_.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 1-19 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_ is/are allowed.
- 6) ☐ Claim(s) 1-5, 7-10, 12-15, 17, 19 is/are rejected.
- 7) ☐ Claim(s) 6, 11, 16 and 18 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

## Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

## Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 of PTO/SB/08)  
Paper No(s)/Mail Date 1/28/02 4/24/02
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_.

## **DETAILED ACTION**

### ***Claim Rejections - 35 USC § 112***

The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claims 3 and 14 are rejected under 35 U.S.C. 112, first paragraph, because the specification, while being enabling for the columnar structure in the film when sputtering is employed, does not reasonably provide enablement for said columnar structure when the other deposition methods, e.g. liquid phase, is employed. The specification does not enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the invention commensurate in scope with these claims.

Claims 4 and 19 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention. Claims 4 and 19 recite "a method in combination of these methods" wherein "these methods" refers back to a sputtering method, reactive deposition method, etc. The specification has been reviewed but is not found enabling for a combination of methods to be used for forming the claimed thin film.

***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1, 4, 8, 9, 12 and 19 are rejected under 35 U.S.C. 102(b) as being anticipated by Ribes et al. (“Thin Films on Amorphous Electrode Materials for Li Microbatteries”)

Regarding independent claims 1 and 12 and dependent claims 4 and 19, Ribes et al. teaches a lithium secondary battery in which the positive electrode (during charging) is comprised of a thin film containing iron oxide or  $\text{Fe}_2\text{O}_3$ . (p. 167) As to the product-by-process limitation of the thin film being “formed by depositing on a substrate from vapor phase or liquid phase” (independent claims 1, 12) or a “sputtering method” (dependent claims 4, 19), this process limitation is not given patentable weight as the limitation does not give breadth or scope to the product claim. Notwithstanding, the prior art product disclosed by Ribes et al. appears to be the same or similar to the claimed product insofar as being formed by vapor phase deposition, i.e. sputtering. In the event that any differences can be shown by the product of the product-by-process claims, such differences would have been obvious to the skilled artisan as a routine modification of the product absent of a showing of unexpected results. *In re Thorpe*, 227 USPQ 964 (Fed. Cir. 1985).

Regarding dependent claims 8 and 9, a metal current collector serving as the substrate is deemed electron conductive by definition. (p. 36)

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Claims 1-4, 8, 12-14 and 19 are rejected under 35 U.S.C. 102(b) as being anticipated by Sarradin. ("Study of  $\text{Fe}_2\text{O}_3$ -based thin film electrodes for lithium-ion batteries")

Regarding independent claims 1 and 12 and dependent claims 4 and 19, Sarradin teaches a lithium ion secondary battery in which the positive electrode (during charging) is comprised of a thin film containing iron oxide or  $\text{Fe}_2\text{O}_3$ . (p. 36) As to the product-by-process limitation of the thin film being "formed by depositing on a substrate from vapor phase or liquid phase" (independent claims 1, 12) or a "sputtering method" (dependent claims 4, 19), this process limitation is not given patentable weight as the limitation does not give breadth or scope to the product claim. Notwithstanding, the prior art product disclosed by Ribes et al. appears to be the same or similar to the claimed product insofar as being formed by vapor phase deposition, i.e. sputtering. In the event that any differences can be shown by the product of the product-by-process claims, such differences would have been obvious to the skilled artisan as a routine modification of the product absent of a showing of unexpected results. *In re Thorpe*, 227 USPQ 964 (Fed. Cir. 1985).

Regarding dependent claims 2 and 13, the examiner notes that the feature of "a crystal of  $\text{Fe}_2\text{O}_3$  or  $\text{Fe}_3\text{O}_4$ " is claimed in the singular. Additionally, this limitation is given its broadest reasonable interpretation of a crystal, such as a particle, and not a crystalline structure *per se*. To this extent, while Sarradin teaches that the deposited film is largely amorphous, the film also incorporates bulk  $\alpha\text{-Fe}_2\text{O}_3$ . (p. 37) As to dependent claims 3 and 14, a columnar structure is considered shown by Sarradin in Figure 1, wherein the  $\text{Fe}_2\text{O}_3$  deposited thin film layer appears to show vertical striations relative to the substrate surface.

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Regarding dependent claim 8, the substrate on which the thin film is formed is considered electron conductive as it is part of the final electrode structure.

Regarding the above rejections based on Ribes or Sarradin et al., the examiner notes that during the charge cycle in a secondary battery, a negative electrode functions as a positive electrode in order for the direction of electron flow to be reversed as compared to that during the discharge cycle. Therefore, the designation of a positive electrode is considered to merely follow conventional practice in view of its function during the discharge cycle. To this extent, both Ribes et al. and Sarradin are considered drawn to a positive electrode at least during the charge cycle.

Claims 1, 2, 4, 5, 7-9, 12, 13, 15, 17 and 19 are rejected under 35 U.S.C. 102(b) as being anticipated by Ito. (“K<sup>+</sup> -  $\beta$ -Ferrite as a New Cathode Active Material for Lithium Secondary Battery”)

Regarding independent claims 1 and 12 and dependent claims 4 and 19, Ito teaches a lithium ion secondary battery in which the positive electrode or cathode is comprised of a film containing  $\beta$ -ferrite (page C1-161) As to the product-by-process limitation of the film being “formed by depositing on a substrate from vapor phase or liquid phase” (independent claims 1, 12) or a “sputtering method” (dependent claims 4, 19), this process limitation is not given patentable weight as the limitation does not give breadth or scope to the product claim. Notwithstanding, the prior art product disclosed by Ito appears to be the same or similar to the claimed product insofar as the final product is similarly characterized as a “thin film” to the

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extent that it is disclosed as “very thin” at ca. 6 Å. (see “Introduction”) In the event that any differences can be shown by the product of the product-by-process claims 1 and 12, such differences would have been obvious to the skilled artisan as a routine modification of the product absent of a showing of unexpected results. *In re Thorpe*, 227 USPQ 964 (Fed. Cir. 1985).

Regarding dependent claims 2 and 13, the examiner notes that the feature of “a crystal of  $\text{Fe}_2\text{O}_3$  or  $\text{Fe}_3\text{O}_4$ ” is claimed in the singular. Additionally, this limitation is given its broadest reasonable interpretation of a crystal, such as a particle, and not a crystalline structure *per se*. Notwithstanding, Ito is considered to teach a non-amorphous crystal or crystalline film of  $\text{K}_{1.33}\text{Fe}_{11}\text{O}_{17}$  that reads on applicant’s claimed single “crystal” of iron oxide.

With respect to dependent claims 5, 7, 15 and 17, the oxide film contains potassium within the final product  $\text{K}_{1.33}\text{Fe}_{11}\text{O}_{17}$ . The cathode also consists of carbon such as acetylene black powder. Regarding dependent claim 8, the substrate on which the thin film is formed is considered electron conductive as it is part of the final electrode structure. The substrate or current collector is metal such as Mo mesh. (refer to the “Experimental” section for the foregoing)

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

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Claim 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over either Ribes et al. as applied to claims 1, 4, 8, 9, 12 and 19 above or Sarradin as applied to claims 1, 2, 4, 8, 12, 13 and 19 above or Ito as applied to claims 1, 2, 4, 5, 7-9, 12, 13, 15, 17 and 19 above, in view of Tomiyama et al. (U.S. Pat. 6,190,803).

The teachings of Ribes et al., Sarradin and Ito are discussed above.

Regarding claim 10, the examiner relies on Tomiyama et al. merely to show that it would be obvious to one of ordinary skill in the art to employ aluminum as the substrate, i.e. current collector, in either Ribes et al., Sarradin or Ito in view of Tomiyama et al.'s teaching that aluminum provides for increased strength and anticorrosion properties. (col. 1 line 32-52)

#### *Allowable Subject Matter*

Claims 6 and 16 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is a statement of reasons for the indication of allowable subject matter: the prior art of record and to the examiner's knowledge do not teach or render obvious the instant invention regarding a concentration of potassium gradually decreased towards the surface of the thin film from the substrate.

Claims 11 and 18 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.



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The following is a statement of reasons for the indication of allowable subject matter: the prior art of record and to the examiner's knowledge do not teach or render obvious the instant invention regarding the substrate and thin film being mutually diffused in the interface.

### *Conclusion*

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. U.S. Pat. 5,955,220 to Takada et al. is cited of cumulative relevance.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Julian Mercado whose telephone number is (571) 272-1289. The examiner can normally be reached on Monday through Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Patrick J. Ryan, can be reached on (571) 272-1292. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0661.

A handwritten signature in black ink, appearing to be "jam", with a large loop at the top.A handwritten signature in black ink, appearing to be "Patrick Ryan", with a large loop at the top.

Patrick Ryan  
Supervisory Patent Examiner  
Technology Center 1700